IN THE CLAIMS

This listing of the claim will replace all prior versions and listings of claim in the present application.

Listing of Claims

1. (currently amended) A system comprising:

a first device;

a second device;

a plurality of paths each being connected between the first device and the second device; and

a third device which is connected to the first device,

wherein the first device transfers data, using a plurality of packets, to the second device across ~~using~~ the plurality of paths,

wherein each of the packets includes an address of the first device as a source address, an address of the second device as a destination address and a portion of the data to be transferred from the first device to the second device,

wherein the number of packets transferred on each path of the plurality of paths is set according to ~~at~~ a predetermined ratio for said each path,

wherein said predetermined ratio for said each path defines ~~defining~~ an amount of ~~communications~~packets to be allocated on said each path ~~of the plurality of paths~~ relative to a total amount of ~~communications~~packets on all of the paths so that packets ~~communication loads~~ on said each path of the plurality of paths are ~~balanced~~adjusted relative to the packets on each of the other paths such that a total amount of packets across the plurality of paths

carries sufficient data equal to a total of the data to be transferred from the first device to the second device,

wherein when the third device detects congestion of packets on one path of the plurality of paths, the third device ~~the plurality of paths and~~ notifies the first device of the congestion on the one path,

wherein the first device changes the predetermined ratio of each of the paths, thereby changing the amount of ~~communications~~packets to be allocated to each of the plurality of paths, based on notification from said third device of the congestion on the one path~~the plurality of paths~~,

wherein the first device transfers data, using the packets, to the second device accross ~~using~~ the plurality of paths according to the changed predetermined ratio of each of the paths,

wherein said first device and the second device are storage devices each having a disk drive for storing data,

wherein the third device has information on the predetermined ratio and a change rate to be applied to the predetermined ratio of each of the paths to compute the changed predetermined ratio of each of the paths, when a change in the predetermined ratio of each of the paths is required, said change rate being a predetermined minimum value the predetemined ratio is to be increased or decreased when changed,

wherein the third device, when congestion on the one path ~~of the plurality of paths~~ has been detected, computes the changed predetermined ratio on each of the paths based on the change rate, and sends information on the changed predetermined ratio of each of the paths to the first device, and

wherein the first device transfers data, using packets, to the second device across ~~using~~ the plurality of paths based on the changed predetermined ratio of ~~on~~ each of the paths.

Claim 2 (canceled).

3. (currently amended) A system comprising:

a first device;

a second device;

a plurality of paths each being connected between the first device and the second device, the plurality of paths being external of each of the first and second devices; and

a third device which is connected to the first device,

wherein the first device transfers data, using a plurality of packets, to the second device across ~~using~~ the plurality of paths at a predetermined ratio for each of the paths,

wherein each of the packets includes an address of the first device as a source address, an address of the second device as a destination address and a portion of the data to be transferred from the first device to the second device,

wherein the number of packets transferred on each path of the plurality of paths is set according to said predetermined ratio for said each path,

wherein said predetermined ratio for said each path defines ~~defining~~ an amount of ~~communications~~packets to be allocated on said each path ~~of the~~

~~plurality of paths~~ relative to a total amount of ~~communications~~packets on all of the paths so that packets ~~communication loads~~ on said each path of the plurality of paths are adjusted relative to the packets on each of the other paths such that a total amount of packets across the plurality of paths carries sufficient data equal to a total of the data to be transferred from the first device to the second device~~balanced~~,

wherein when the third device detects congestion of packets on one path of the plurality of paths, the third device ~~the plurality of paths and~~ notifies the first device of the congestion on the one path,

wherein the first device changes the predetermined ratio of each of the paths, thereby changing the amount of ~~communications~~packets to be allocated to each of the plurality of paths, based on notification from said third device of the congestion on the one path~~plurality of paths~~,

wherein the first device transfers data, using the packets, to the second device across ~~using~~ the plurality of paths according to the changed predetermined ratio of each of the paths,

wherein the first device is a computer, and the second device is a storage device having a disk drive for storing data,

wherein the third device has information on the predetermined ratio and a change rate to be applied to the predetermined ratio of each of the paths to compute the changed predetermined ratio of each of the paths, when a change in the predetermined ratio of each of the paths is required, said change rate being a predetermined minimum value the predetemined ratio is to be increased or decreased when changed,

wherein the third device, when congestion on the one path ~~of the plurality of paths~~ has been detected, computes the changed predetermined ratio on each of the paths based on the change rate, and sends information on the changed predetermined ratio of each of the paths to the first device, and

wherein the first device transfers data, using packets, to the second device across ~~using~~ the plurality of paths based on the changed predetermined ratio of ~~on~~ each of the paths.

4. (original) A system according to claim 3, wherein each of the plurality of paths has a network device for connecting the first device and the second device,

wherein the third device is connected to the network device via a network, and

wherein the third device receives a notification of occurrence of congestion in the network device from the network device via the network.

5. (original) A system according to claim 4, wherein the notification is a notification based upon SNMP Trap.

6. (previously presented) A system according to claim 1, wherein each of the plurality of paths has a network device for connecting the first device and the second device,

wherein the third device is connected to the network device via a network, and

wherein third device receives information on a discarded packet in the network device from the network device via the network and judges congestion of the plurality of paths based on the information on the discarded packet.

7. (original) A system according to claim 6, wherein, in the case in which the number of discarded packets received from the network device is larger than the number of discarded packets received previously, the third device judges that congestion has occurred in the plurality of paths having the network device.

Claim 8 (canceled).

9. (currently amended) A system according to claim 1, wherein when the third device detects recovery from congestion on the one path~~of the plurality of paths~~, the third device computes the changed predetermined ratio for each of ~~among~~ the paths based on the change rate, and sends information on the changed predetermined ratio of each of the ~~among~~ paths to the first device, and

wherein the first device transfers data, using the packets, to the second device across the ~~using a~~ plurality of paths based on the changed predetermined ratio of each of the ~~among~~ paths.

10. (currently amended) A system comprising:

a first device;

a second device; and

a plurality of paths each being connected between the first device and the second device,

wherein the first device transfers data, using a plurality of packets, to the second device across ~~using~~ the plurality of paths at a predetermined ratio for each of the paths,

wherein each of the packets includes an address of the first device as a source address, an address of the second device as a destination address and a portion of the data to be transferred from the first device to the second device,

wherein the number of packets transferred on each path of the plurality of paths is set according to said predetermined ratio for said each path,

wherein said predetermined ratio for said each path defines ~~defining~~ an amount of packets ~~communications~~ to be allocated on said each path ~~each of the plurality of paths~~ relative to a total amount of packets ~~communications~~ on all of the paths so that packets ~~communication loads~~ on said each path of the plurality of paths are ~~balanced~~adjusted relative to the packets on each of the other paths such that a total amount of packets across the plurality of paths carries sufficient data equal to a total of the data to be transferred from the first device to the second device,

wherein the first device detects congestion of packets on one path of the plurality of paths,

wherein the first device changes the predetermined ratio on each of the paths, thereby changing the amount of packets communications to be

allocated on each of the plurality of paths, according to the detection of the congestion of packets on the one path of the plurality of paths by the first device,

wherein the first device transfers data, using the packets, to the second device across ~~using~~ the plurality of paths according to the changed predetermined ratio of each of the paths,

wherein the first device and the second device are storage devices each having a disk drive for storing data,

wherein the first device has information on the predetermined ratio and a change rate to be applied to the predetermined ratio of each of the paths to compute the changed predetermined ratio of each of the paths when a change in the predetermined ratio of each of the paths is required, said change rate being a predetermined minimum value the predetemined ratio is to be increased or decreased when changed,

wherein the first ~~third~~ device, when congestion of packets on the one path of the plurality of paths has been detected, and computes the changed predetermined ratio on each of the paths based on the change rate, and

wherein the first device transfers data, using packets, to the second device across ~~using~~ the plurality of paths based on the changed predetermined ratio of ~~on~~ each of the paths.

Claim 11 (canceled).

12. (currently amended) A system comprising:

a first device;

a second device; and

a plurality of paths each being connected between the first device and the second device, the plurality of paths being external of each of the first and second devices,

wherein the first device transfers data using a plurality of packets, to the second device across ~~using~~ the plurality of paths at a predetermined ratio of each of the paths,

wherein each of the packets includes an address of the first device as a source address, an address of the second device as a destination address and a portion of the data to be transferred from the first device to the second device,

wherein the number of packets transferred on each path of the plurality of paths is set according to said predetermined ratio for said each path,

wherein said predetermined ratio for said each path defines ~~defining~~ an amount of packets ~~communications~~ to be allocated on said each path ~~of the plurality of paths~~ relative to a total amount of packets ~~communications~~ on all of the paths so that packets on each of ~~communication loads among~~ the plurality of paths are ~~balanced~~adjusted relative to the packets on each of the other paths such that a total amount of packets across the plurality of paths carries sufficient data equal to a total of the data to be transferred from the first device to the second device,

wherein the first device detects congestion on one path of the plurality of paths,

wherein the first device changes the predetermined ratio of ~~on~~ each of the paths, thereby changing the amount of packets ~~communications~~ to be allocated on each of the plurality of paths, according to the detection of the congestion on the one path of the plurality of paths by the first device,

wherein the first device transfers data, using the packets, to the second device across ~~using~~ the plurality of paths according to the changed predetermined ratio of each of the paths,

wherein the first device is a computer, and the second device is a storage device having a disk drive for storing data,

wherein the first device has information on the predetermined ratio and a change rate to be applied to the predetermined ratio of each of the paths to compute the changed predetermined ratio of each of the paths, when a change in the predetermined ratio of each of the paths is required, said change rate being a predetermined minimum value the predetermined ratio is to be increased or decreased when changed,

wherein the first ~~third~~ device, when congestion of the one path of the plurality of paths has been detected, computes the changed predetermined ratio of ~~on~~ each of the paths based on the change rate, and

wherein the first device transfers data, using the packets, to the second device across ~~using~~ the plurality of paths based on the changed predetermined ratio of ~~on~~ each of the paths.

13. (previously presented) A system according to claim 10, wherein each of the plurality of paths has a network device for connecting the first device and the second device, and

wherein the first device receives a notification of occurrence of congestion in the network device from the network device via the plurality of paths.

14. (currently amended) A system according to claim 13, wherein the notification is a flag based upon Explicit Congestion Notification (ECN).

15. (original) A system according to claim 12, wherein, in the case in which a response is not returned from the second device for a predetermined period, the first device judges that congestion has occurred in the plurality of paths.

16. (original) A system according to claim 12, wherein, in the case in which an acknowledgement of the data sent to the second device has been received redundantly, the first device judges that congestion has occurred in the plurality of paths.

Claim 17 (canceled).

18. (previously presented) A system according to claim 10, wherein, when a data size, which can be sent to the plurality of paths in which the congestion has occurred, has exceeded a value set in advance after the congestion occurrence, the first device judges that the plurality of paths has recovered from the congestion.

19. (currently amended) A storage system comprising:

a control unit;

a disk device which is connected to the control unit; and

an interface which is connected to a network which is connected between said interface of said storage system and another storage system,

wherein the interface is connected to said another storage system by a plurality of paths in the network,

wherein the control unit sends data stored in the disk device as packets ~~a packet~~ to said another storage system using the plurality of paths at a predetermined ratio for each of the paths,

wherein each of the packets includes an address of said storage system as a source address, an address of said another storage system as a destination address and a portion of the data to be transferred from said storage system to said another storage system,

wherein the number of packets transferred on each path of the plurality of paths is set according to said predetermined ratio for said each path,

wherein said predetermined ratio for said each path defines ~~defining of~~ an amount of packets ~~communications~~ to be allocated on said each path ~~of the plurality of paths~~ relative to a total amount of packets ~~communications~~ on all of the paths so that packets on said each path of ~~communication loads among~~ the plurality of paths are ~~balanced~~adjusted relative to the packets on each of the other paths such that a total amount of packets across the plurality of paths carries sufficient data equal to a total of the data to be transferred from said storage system to said another storage system,

wherein, in the case in which an acknowledgement for a ~~the~~ packet sent to said another storage system on one of the plurality of pats has not been received for a fixed period, the control unit judges that congestion of packets has occurred on the one path of ~~in~~ the plurality of paths,

wherein the control unit changes the predetermined ratio on each of the paths, thereby changing the amount of packets ~~communications~~ to be allocated on each of the plurality of paths, according to the occurrence of the congestion on the one path and performs packet transfer of data to said another storage system according to the changed predetermined ratio of ~~on~~ each of the paths,

wherein the control unit has information on the predetermined ratio and a change rate to be applied to the predetermined ratio of each of the paths to compute the changed predetermined ratio of each of the paths when a change in the predetermined ratio of each of the paths is required, said change rate being a predetermined minimum value the predetermined ratio is to be increased or decreased when changed,

wherein the control unit, when congestion of packets on the one path of the plurality of paths has been detected, computes the changed predetermined ratio of ~~on~~ each of the paths based on the change rate, and

wherein the control unit transfers data, using the packets, to said another storage system across ~~using~~ the plurality of paths based on the changed predetermined ratio of ~~on~~ each of the paths.

20. (currently amended) A system comprising:

a first storage device having a disk drive for storing data;

a second storage device having a disk drive for storing data;

a plurality of paths each connected between the first storage device and the second storage device; and

a computer which is connected to the first storage device,

wherein a switch is included in the plurality of paths,

wherein the first storage device transfers data, using a plurality of packets, to the second storage device across ~~using~~ the plurality of paths at a predetermined ratio of each of the paths,

wherein each of the packets includes an address of the first device as a source address, an address of the second device as a destination address and a portion of the data to be transferred from the first device to the second device,

wherein the number of packets transferred on each path of the plurality of paths is set according to said predetermined ratio for said each path,

wherein said predetermined ratio for said each path defines ~~defining~~ an amount of packets ~~communications~~ to be allocated on said each path ~~of the plurality of paths~~ relative to a total amount of packets ~~communications~~ on all of the paths so that packets ~~communication loads~~ on said each path of the plurality of paths are ~~balanced~~adjusted relative to the packets on each of the other paths such that a total amount of packets across the plurality of paths carries sufficient data equal to a total of the data to be transferred from the first device to the second device,

wherein the computer detects congestion of packets on one ~~a first~~ path of ~~among~~ the plurality of paths based on a notification from the switch

and notifies the first storage device of a changed predetermined ratio for each of the paths to be used after detection of the congestion on the one path,

wherein the first storage device changes the predetermined ratio of each of the ~~among~~ paths to the changed predetermined ratio of each of the paths, thereby changing the amount of packets ~~communications~~ to be allocated on each of the plurality of paths, based on the changed predetermined ratio of each of the paths from the computer and transfers data, using the packets, to the second storage device across ~~using~~ the plurality of paths according to the changed predetermined ratio of each of the paths,

wherein the computer has information on the predetermined ratio and a change rate to be applied to the predetermined ratio of each of the paths to compute the changed predetermined ratio of each of the paths when a change in the predetermined ratio of each of the paths is required, said change rate being a predetermined minimum value the predetermined ratio is to be increased or decreased when changed,

wherein the computer, when congestion of packets on the one path of the plurality of paths has been detected, computes the changed predetermined ratio of ~~on~~ each of the paths based on the change rate, and sends information on the changed predetermined ratio of each of the paths to the first storage device,

wherein the first storage device transfers data, using the packets, to the second storage device across ~~using~~ the plurality of paths based on the changed predetermined ratio of ~~on~~ each of the paths,

wherein the computer judges recovery from the congestion on the one ~~of the first~~ path and notifies the first storage device of a further changed predetermined ratio of each of the paths, and

wherein the first storage device changes the changed predetermined ratio of each of the ~~among~~ paths to the further changed predetermined ratio of each of the paths and transfers data, using the packets, to the second storage device across ~~using~~ the plurality of paths according to the further changed predetermined ratio of each of the paths.

21. (currently amended) A storage system comprising:

a control unit;

a disk device which is connected to the control unit; and

an interface which is connected to a network which is connected between said interface of said storage system and of a plurality of other devices,

wherein said network is external of each of said storage system and the other devices,

wherein the interface is connected to the other devices by a plurality of paths in the network,

wherein the control unit sends data stored in the disk device, using a plurality of packets, ~~as a packet~~ to the other devices across ~~using~~ the plurality of paths at a predetermined ratio for each of the paths,

wherein each of the packets includes an address of said storage system as a source address, addresses of the other devices as destination

addresses and a portion of the data to be transferred from said storage system to the other devices,

wherein the number of packets transferred on each path of the plurality of paths is set according to said predetermined ratio for said each path,

wherein said predetermined ratio for said each path defines ~~defining~~ an amount of packets ~~communications~~ to be allocated on said each path ~~of the plurality of paths~~ relative to a total amount of packets ~~communications~~ on all of the paths so that packets ~~communication loads~~ on said each path of the plurality of paths are ~~balanced~~adjusted relative to the packets on each of the other paths such that a total amount of packets across the plurality of paths carries sufficient data equal to a total of the data to be transferred from said storage system to the other devices,

wherein, in the case in which an acknowledgement for a ~~the~~ packet sent to the other devices on one path of the plurality of paths has not been received for a fixed period, the control unit judges that congestion has occurred on the one path of ~~in~~ the plurality of paths,

wherein the control unit changes the predetermined ratio of ~~on~~ each of the paths, thereby changing the amount of packets ~~communications~~ to be allocated on each of the plurality of paths, according to the occurrence of the congestion on the one path and performs packet transfer of data to the other devices at the changed predetermined ratio of ~~on~~ each of the paths,

wherein the control unit has information on the predetermined ratio and a change rate to be applied to the predetermined ratio of each of the paths to compute the changed predetermined ratio of each of the paths when

a change in the predetermined ratio of each of the paths is required, said change rate being a predetermined minimum value the predetermined ratio is to be increased or decreased when changed,

wherein the control unit, when congestion on the one path of the plurality of paths has been detected, computes the changed predetermined ratio of ~~on~~ each of the paths based on the change rate, and

wherein the control unit transfers data, using the packets, to the other devices across ~~using~~ the plurality of paths based on the changed predetermined ratio of ~~on~~ each of the paths.

22. (previously presented) A system according to claim 1, wherein said third device when computing the changed predetermined ratio, performs processing for reducing a ratio on each of the paths, which is assigned to a path in which congestion has occurred, at a designated change rate and allocates the reduced amounts to the other paths.

23. (previously presented) A system according to claim 22, wherein said third device when computing the changed predetermined ratio includes:

means for, in a case in which a same number of congestion has occurred in all paths being used, and in a case in which all paths are recovered from the congestion, performing a process for returning the changed predetermined ratio on each of the paths to a default value.

24. (previously presented) A system according to claim 1, wherein said third device when computing the changed predetermined ratio includes:

means for, upon detecting that a congestion has occurred on a path, calculating a ratio being used on the path at the time of congestion and a difference between the ratio at the time of congestion and a ratio set in advance for the path upon which the congestion has occurred and allocating the difference to ratios of the other paths.

25. (currently amended) A system according to claim 1, further comprising:

means for managing a ratio ~~a~~ change flag and a ratio change rate by use of a task management table, managing a default ratio and a changed ratio by use of a path management table and updating the predetermined ratio in a ~~the~~ path management table in accordance with the change rate in the task management table.

26. (currently amended) A system according to claim 3, further comprising:

means for managing a ratio ~~a~~ change flag and a ratio change rate by use of a task management table, managing a default ratio and a changed ratio by use of a path management table and updating the predetermined ratio in a ~~the~~ path management table in accordance with the change rate in the task management table.

27. (currently amended) A system according to claim 10, further comprising:

means for managing a ratio ~~a~~ change flag and a ratio change rate by use of a task management table, managing a default ratio and a changed ratio by use of a path management table and updating the predetermined ratio in a ~~the~~ path management table in accordance with the change rate in the task management table.

28. (currently amended) A system according to claim 12, further comprising:

means for managing a ratio ~~a~~ change flag and a ratio change rate by use of a task management table, managing a default ratio and a changed ratio by use of a path management table and updating the predetermined ratio in a ~~the~~ path management table in accordance with the change rate in the task management table.

29. (currently amended) A storage system according to claim 19, further comprising:

means for managing a ratio ~~a~~ change flag and a ratio change rate by use of a task management table, managing a default ratio and a changed ratio by use of a path management table and updating the predetermined ratio in a ~~the~~ path management table in accordance with the change rate in the task management table.

30. (currently amended) A system according to claim 20, further comprising:

means for managing a ratio ~~a~~ change flag and a ratio change rate by use of a task management table, managing a default ratio and a changed ratio by use of a path management table and updating the predetermined ratio in a ~~the~~ path management table in accordance with the change rate in the task management table.

31. (currently amended) A storage system according to claim 21, further comprising:

means for managing a ratio ~~a~~ change flag and a ratio change rate by use of a task management table, managing a default ratio and a changed ratio by use of a path management table and updating the predetermined ratio in a ~~the~~ path management table in accordance with the change rate in the task management table.

32. (currently amended) A system according to claim 1, further comprising:

a function for recovering a ~~the~~ path using the predetermined ratio for said path.

33. (currently amended) A system according to claim 3, further comprising:

a function for recovering a ~~the~~ path using the predetermined ratio for said path.

34. (currently amended) A system according to claim 10, further comprising:

a function for recovering a ~~the~~ path using the predetermined ratio for said path.

35. (currently amended) A system according to claim 12, further comprising:

a function for recovering a ~~the~~ path using the predetermined ratio for said path.

36. (currently amended) A storage system according to claim 19, further comprising:

a function for recovering a ~~the~~ path using the predetermined ratio for said path.

37. (currently amended) A system according to claim 20, further comprising:

a function for recovering a ~~the~~ path using the predetermined ratio for said path.

38. (currently amended) A storage system according to claim 21, further comprising:

a function for recovering a ~~the~~ path using the predetermined ratio for said path.